

## **REMARKS**

### **I. Introduction**

By the present Amendment, claims 1 and 17 have been amended. No claims have been added or cancelled. Accordingly, claims 1-3, and 5-20 remain pending in the application. Claims 1 and 17 are independent.

### **II. Office Action Summary**

In the Office Action of October 1, 2008, claims 8 and 12 were objected to because of various informalities. Claims 1-20 were rejected under 35 USC §103(a) as being unpatentable over U.S. Patent No. 6,044,913 issued to Shiki et al. ("Shiki") in view of U.S. Patent No. 6,116,244 issued to Hossack et al. ("Hossack") and further in view of U.S. Patent No. 6,239,796 issued to Alexander et al. ("Alexander"). This rejection is respectfully traversed.

### **III. Claim Objections**

Claims 8 and 12 were objected to because of various informalities. Regarding this objection, the Office Action indicates that these claims recite the term "the variance" which lacks proper antecedent basis.

By the present Amendment, Applicants have amended independent claim 1, from which these claims depend, to recite --a variance--, thereby correcting the lack of antecedent basis. Withdrawal of this objection is therefore respectfully requested.

### **IV. Rejections under 35 USC §103**

Claims 1-20 were rejected under 35 USC §103(a) as being unpatentable over Shiki in view of Hossack, and further in view of Alexander. Regarding this rejection, the Office Action alleges that Shiki discloses an ultrasound apparatus for forming a

tomogram of an examinee by transmitting/receiving an ultrasound wave via an ultrasound probe. The Office Action indicates that Shiki discloses a color Doppler image forming means, image processing means for both the tomogram and the Doppler image, and a display to display the images. The Office Action admits that Shiki fails to disclose a degree of transparency of the color Doppler image. Hossack is relied upon for disclosing control of the degree of the transparency of the color Doppler image based on blood flow information or variance of the blood flow. Alexander is relied upon for disclosing display of either only the selected dialog box or the original with the selected dialog boxes. The Office Action concludes that it would have been obvious to combine the teachings of Shiki, Hossack, and Alexander to arrive at the claimed invention. Applicants respectfully disagree.

By the present Amendment, Applicants have amended independent claim 1 to better define the claimed invention with respect to features that are not disclosed by the art of record. As amended, independent claim 1 defines an ultrasound diagnostic apparatus that comprises:

- a tomogram forming means for forming a tomogram of a diagnosis portion of an examinee by transmitting/receiving an ultrasound wave to/from the examinee via an ultrasound probe;

- color Doppler image forming means for forming a color Doppler image based on a Doppler signal obtained from the diagnosis portion;

- image processing means for performing image processing on the tomogram and the color Doppler image;

- display means for displaying images obtained by the image processing means, the tomogram and the color Doppler image being color displayed on the display means,

- wherein the image processing means causes the color Doppler image to be displayed transparently;

- characterized in further comprising:

a transparency control means for controlling a degree of the transparency of the color Doppler image of the transparent display; and

selection means for selecting one or both of a luminance/hue color bar, which is based on the information of a velocity and variance of a blood flow, and/or a transparency color bar, which is based on the information of the variance, for alternatively or simultaneously displaying the luminance/hue color bar and/or the transparent color bar on the display means.

According to independent claim 1, the ultrasound diagnostic apparatus includes a tomogram forming means for forming a tomogram of a diagnosis portion of an examinee by transmitting/receiving ultrasound waves to/from the examinee using an ultrasound probe; a Doppler image forming means for forming a color Doppler image based on a Doppler signal obtained from the diagnosis section; an image processing means for performing image processing on the tomogram and color Doppler image; and display means for displaying the images obtained by the image processing means, the tomogram, and Doppler image in color. A transparency control means is provided to control the degree of transparency of the color Doppler image of the transparent display, and a selection means is provided to select either or both of the luminance/hue color bar and/or a transparency color bar for alternate or simultaneous display of the luminance/hue color bar and/or the transparent color bar on the display means. According to independent claim 1, the luminance/hue color bar is based on information corresponding to the velocity and variance of blood flow. Furthermore, the transparency color bar is based on information corresponding to the variance of blood flow.

As discussed in the Specification, color information of the three-dimensional voxel is based on the speed and variance using a luminance/hue color bar. Accordingly, the speed, reflection intensity, and variance are considered for each

point on the three-dimensional voxels. See paragraph [0027] and Fig. 5 of the published application. Additionally, the transparency of each point on the three-dimensional voxel is decided based on the variance. See paragraph [0028]. Thus, according to independent claim 1, the either or both a luminance/hue color bar and/or transparency color bar can be simultaneously or alternatively displayed with a color Doppler image. The luminance/hue color bar is based on information corresponding to both the velocity and variance of blood flow, while the transparency color bar is based on information corresponding to the variance of blood flow.

At least one advantage achieved by such an arrangement is the ability for an operator to quickly and easily assess the velocity and variance of blood flow at desired locations by simply referencing the luminance/hue color bar. The operator can also recognize whether the blood flow is turbulent or not by referencing the transparency color bar.

The Office Action alleges that the combination of Shiki, Hossack, and Alexander discloses all of the features recited in independent claim 1. This does not appear to be the case. Shiki discloses an ultrasonic diagnosis apparatus that includes an ultrasound probe, a transmitter, a receiver, a CFM processor, a tomographic image processor, and a display unit. Shiki scans a desired section by transmitting and receiving an ultrasound pulse to and from the subject, and displays images obtained by the scanning. A corrector is provided to correct the velocities of the moving element based on the standard velocity. The corrected velocity data can be subsequently visualized on display unit. While Shiki discloses color bars, they are based on either the velocity or power of the blood flow. Shiki is completely silent on displaying either or both a luminance/hue color bar based on the information of

the velocity and variance of blood flow and/or a transparency color bar based on the variance.

Hossack discloses a method and system for generating three-dimensional representations using opacity modulation. The opacity levels are controlled as a function of a Doppler parameter. Thus, some of the data is rendered more opaque than others. Based on this difference in opacity, it is possible to emphasize areas of clinical interest, such as a leak in a heart valve or other areas associated with high variance or velocity jets, on the display. Hossack is completely silent on displaying either or both a luminance/hue color bar based on the information of the velocity and variance of blood flow and/or a transparency color bar based on the variance.

Alexander discloses a signal measurement system which includes an operating system and a graphical user interface. A dialog box control system is provided to manage display and interactivity with respect to a selected one of a plurality of dialog boxes to be opened on the graphical user interface in accordance with a selected one of a plurality of dialog launch modalities. Alexander also appears to be completely silent on displaying either or both a luminance/hue color bar based on the information of the velocity and variance of blood flow and/or a transparency color bar based on the variance.

Consequently, the combination of Shiki, Hossack, and Alexander necessarily fails to disclose features that are recited in independent claim 1, such as:

selection means for selecting one or both of a luminance/hue color bar, which is based on the information of a velocity and variance of a blood flow, and/or a transparency color bar, which is based on the information of the variance, for alternatively or simultaneously displaying the luminance/hue color bar and/or the transparent color bar on the display means.

It is therefore respectfully submitted that independent claim 1 is allowable over the art of record.

Claims 2, 3, and 5-16, 19, and 20 depend, either or indirectly, from independent claim 1, and are therefore believed allowable for at least the reasons set forth above with respect to independent claim 1. In addition, these claims each introduce novel elements that independently render them patentable over the art of record.

As amended, independent claim 17 defines an ultrasound diagnosing method that comprises the steps:

- a transmitting/receiving step for transmitting/receiving an ultrasound wave to/from an examinee via an ultrasound probe;

- a forming step for forming a tomogram of a diagnosis portion of the examinee;

- an imaging step for forming a color Doppler image based on a Doppler signal obtained from the diagnosis portion;

- an image processing step for performing image processing on the tomogram and the color Doppler image;

- a first display step for displaying the images which underwent the image processing so as to display the tomogram and the color Doppler image in color display;

- a second display step for displaying the color Doppler image transparently which includes a control step for controlling a degree of the transparency of the color Doppler image of the transparent display; and

- a step of selecting one or both of a luminance/hue color bar, which is based on the information of a velocity and variance of a blood flow, and/or a transparency color bar, which is based on the information of the variance, for alternatively or simultaneously displaying the luminance/hue color bar and/or the transparent color bar on the display means.

The ultrasound diagnosis method of independent claim 17 recites various steps that are somewhat similar to those recited in independent claim 1. For example, the method includes a step of selecting one or both of a luminance/hue

color bar and/or a transparency bar such that the luminance/hue color bar and the transparent color bar can be displayed either simultaneously or alternatively on a display means. Furthermore, the luminance/hue color bar is based on information corresponding to the velocity and variance of blood flow, while the transparency color bar is based on information corresponding to the variance of blood flow. As previously discussed with respect to independent claim 1, the art of record fails to provide any disclosure or suggestion for such features.

It is therefore respectfully submitted that independent claim 17 is allowable over the art of record.

Claim 18 depends from independent claim 17, and is therefore believed allowable for at least the reasons set forth above with respect to independent claim 17. In addition, this claim introduces novel elements that independently render it patentable over the art of record.

## **V. Conclusion**

For the reasons stated above, it is respectfully submitted that all of the pending claims are now in condition for allowance. Therefore, the issuance of a Notice of Allowance is believed in order, and courteously solicited.

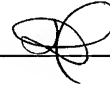
If the Examiner believes that there are any matters which can be resolved by way of either a personal or telephone interview, the Examiner is invited to contact Applicants' undersigned attorney at the number indicated below.

**AUTHORIZATION**

Applicants request any shortage or excess in fees in connection with the filing of this paper, including extension of time fees, and for which no other form of payment is offered, be charged or credited to Deposit Account No. 01-2135 (Case: 529.45793X00).

Respectfully submitted,  
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